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PEACH TREE SHORT LIFE: A NEMATODE ASSOCIATED DISEASE.

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Replant problems of peach trees, defined as the unsatisfactory performance of trees grown in soil from which peach trees were previously removed, has plagued orchardists since the late 1600's (7). Peach tree replant problems have been further defined by such terms as soil sickness, sudden decline and peach root residue toxicity. In the southeastern United States a different type of peach disease exists which has been termed peach tree short life (PTSL). This disease syndrome is characterized by a sudden collapse of new growth above the soil line and subsequent death of the aboveground portion of the tree in the late winter/early spring following cold injury and/or bacterial canker (*Pseudomonas syringae* pv *syringae*) infection. Damage from cold injury is encountered more often than bacterial canker. PTSL is usually associated with "old" peach tree sites (especially sandy soils) where a new planting closely follows removal of PTSL trees. However, "old" peach tree land is not always a prerequisite for the initiation of the disease (3). Therefore, PTSL is not a replant problem by definition.

Symptomatology: General above ground symptoms are similar to those of any plant deprived of an adequate root system. Typically, initiation of normal tree growth is followed by sudden chlorosis, wilting and then death shortly after bloom (Fig. 1). In severe cases, neither flower nor leaf buds open at all.

The bark may crack and separate from the tree trunk and scaffold limbs. Discoloration of the cambial area and prevalence of a sour sap odor, caused by fermentation of carbohydrates released into the intercellular spaces, are evident and correlated with suddenness of collapse (2). Alternate zones of healthy and darkened tissue are revealed in successive cuts on scaffold limbs and tree trunk (Fig. 2 & 3). The diseased tissue usually does not extend below the soil line (Fig. 3). The main root system beneath the soil line appears healthy, whereas feeder roots may appear unhealthy and necrotic (Fig. 4). This results from the ectoparasitic feeding habit of the ring nematode, *Criconemella xenoplax* (Raski) Luc & Raski (Fig. 5) when present . Suckering can be observed in summer at the crown region of the tree because the primary root system remains alive (Fig. 1).

Predisposing Factors: Several abiotic agents have been implicated as "predisposing factors" of trees to cold injury and/or bacterial canker including 1) rapid fluctuation in late winter/early spring temperatures that are typical in the Southeast, 2) fall pruning and 3) acid soils. The principal biotic factor that is a direct cause of PTSL is *C. xenoplax* (3,4,9). Other ring nematode species have been detected in PTSL orchards,

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but are not involved in this disease complex (5,6). Rootstocks also influence tree longevity from PTSL. 'Lovell' and 'Halford' will survive longer than 'Nemaguard' on a PTSL site.

Ring Nematode Life Cycle: The life cycle of *C. xenoplax* is completed in 24-34 days at 22-26 C, under laboratory conditions (8). The development of nematode life stages requires 11-13 days for eggs, 3-5 days for second-stage juveniles (J2), 4-7 days for J3, 5-6 days for J4 and 2-3 days for adult female maturation. Adult females lay 8-15 eggs over a 2-3 day period. Egg deposition occurs in close proximity to host roots or on the root surface. Reproduction is presumed to be generally by parthenogenesis since males are very scarce.

Control: Peach tree losses from PTSL can be limited if several research based management practices, known as the "10-Point Program", are followed (1). The program consists of 1) adjusting soil pH prior to planting (pH 6.0-6.5), 2) preplant subsoiling to break up hard pans, 3) preplant fumigation: 1,3-D (1,3-dichloropropene and related chlorinated C3 hydrocarbons) or methyl bromide are the only two registered soil fumigants presently labeled for use, 4) use of certified nematode- and disease-free nursery stock, 5) use of 'Lovell' or 'Halford' rootstock, 6) maintain appropriate lime and nutrient levels as based on soil and foliar analyses, 7) pruning after February 1 to limit cold injury, and not October through January, 8) control weeds with herbicides and/or shallow cultivation, 9) orchard sanitation, and 10) Postplant nematode control. Presently the only registered nematicide treatment is phenamiphos, which is applied as a split application.

In summary, the presence of the ring nematode is extremely important to this disease complex. Control of the ring nematode will prolong tree life and limit their susceptibility to PTSL. Nematode management practices allow for some adjustment in pruning time (3,9). The postplant nematode control program is a long-term commitment because multiple applications are required annually to obtain an effect, with expected responses 1 1/2 - 2 years after application. Efforts are underway to 1) identify and develop rootstocks that are *C. xenoplax* resistant, which is the ultimate goal for long-lasting nematode control, and 2) develop ground covers and/or rotational crops that, when planted alone or in association with peaches, will suppress nematode density.

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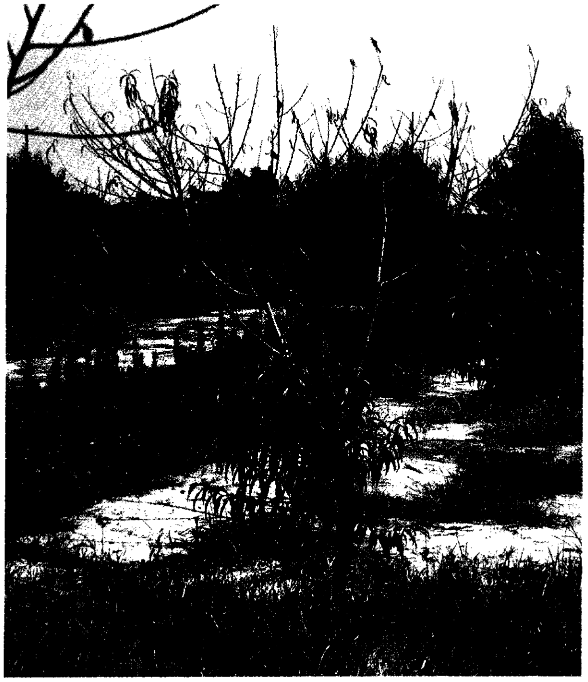

Fig. 1. Peach tree short life in a 5-year-old orchard in Georgia. Note suckering that has originated below the soil line.

Fig. 2. Typical alternating zones of healthy and darkened tissue on scaffold limbs of peach resulting from cold injury.

Fig. 3. Typical cold injury in the cambium of the trunk above the soil line and healthy viable tissue below the soil line.

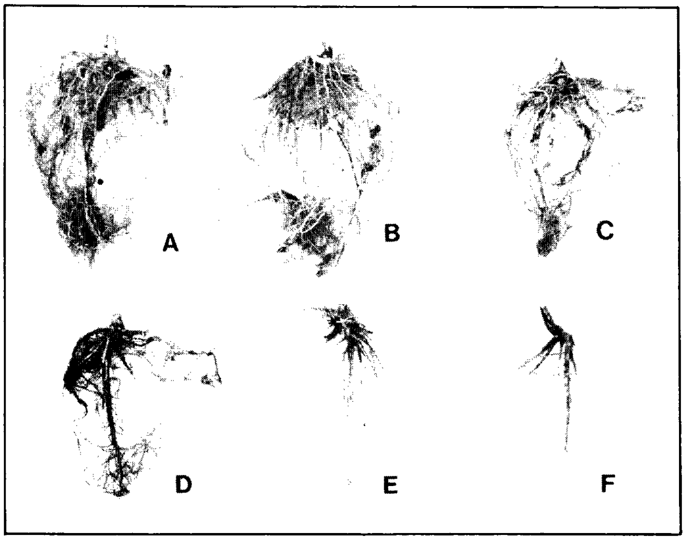

Fig. 4. Influence of six different initial inoculum densities of Criconemella xenoplax per 1500 cm^3 soil on 'Nemaguard' peach root growth in the greenhouse after 189 days. (A = 0; B = 112; C = 448; D = 1,792; E = 7,168; and F = 14,336.)

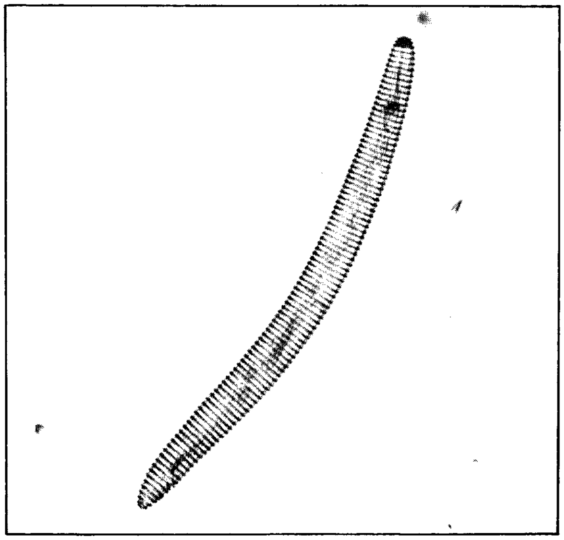

Fig. 5. Photomicrograph of Criconemella xenoplax.

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